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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,068	12/26/2006	Hwa Yaw Tam	P71474US0	8875

136 7590 08/05/2009

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EXAMINER	
BENLAGSIR, AMINE	

ART UNIT	PAPER NUMBER
4147	

MAIL DATE	DELIVERY MODE
08/05/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/594,068	TAM ET AL.	
	Examiner	Art Unit	
	AMINE BENLAGSIR	4147	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 26 December 2006.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-17 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-17 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 26 December 2006 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 02/16/07 & 03/05/09.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to under 37 CFR 1.83(a) because

Figure 1 & 2 with numerical labeling should be accompanied with corresponding "text" labeling" as described in the specification, for example Fig.1 el. S1 should be labeled “Bragg grating”.

Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-2 and 16-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Colbaugh Patent No. 5330136.

As per Claim 1, Colbaugh discloses a railway monitoring system, comprising:

an optical fiber, wherein a first part of the fiber is attachable to one of a pair of tracks of a rail (Colbaugh Fig.6:70/), and wherein a characteristic of the first part of the fiber Is variable in correspondence to variance of a characteristic of said one track where the first part of fiber is attached (Colbaugh col.6 lines 39-50: “FIG. 6 and 7 illustrate elongated optical fiber conductors attached to the rack section at a plurality of spaced apart discrete locations. Standard wayside structures such as rail-retaining tie plates and rail crossties carry portions of a passing vehicle's weight load which can be sensed utilizing the teachings herein. FIG. 6 illustrates an elongated optical fiber conductor 70 having sensitized sections 71 and 72 respectively placed between rail 73 and rail-retaining tie plates 74 and 75. Alternatively, sensitized sections 71 and 72 could be respectively placed between tie plates 74 and 75 and rail crossties 76 and 77/Colbaugh describes structure 36 as the same as track described by Tam.

col.5 lines 23-35: “Strain effects imposed on engaging structure 36 due to bending, warping or vibration cause fiber 35 to become slightly longer than the at-rest position indicated by broken line 39. As a result, the phase of propagated light signals emanated by fiber 35 will be slightly shifted with respect to corresponding signals emanating from fiber 37. The resulting constructive or destructive interference effects can be measured at wave front interferometric detector ("WFID") 40 to determine the degree of strain imposed on engaging structure 36. In addition to detecting the presence of a railway vehicle, warped rail or the like may be detected by the occurrence of vibration above a threshold level");

an optical signal emitter connected to the fiber for emitting an optical signal into the fiber, wherein the fiber generates at least a first altered optical signal, which contains information relating to the variance of the characteristic of the part of the fiber (Colbaugh col.4 lines 3-8: “In optical communication with sets 12A-E is optical sensor 13 which responds to the presence of railway vehicle 14 by emitting a vehicle detection signal which may be a reflection or change in intensity or other properties of a reference light signal or may be a generated light signal”/ col.4 lines 23-25: “Many details of attaching sensor 13 to the track section will depend on the particular technique used to analyze the variable light propagation characteristics”); and

an optical signal analyzer connected to the fiber for receiving and analyzing the first altered optical signal so as to ascertain the variance of said characteristic

of said one track based upon the Information contained in the first altered optical signal (Colbaugh col.4 lines 55-66: “Optical time domain reflectometer ("OTDR") 20 may be utilized to measure this reflective light and map the variation of microbending strain experienced over a distributed length of fiber. Specifically, OTDR 20 impresses a pulsed light signal or edge onto fiber 15 and correlates the return time-of-flight of reflected energy to generate a time/distance plot of the reflected pulse image. OTDR 20 is also particularly useful in monitoring structural integrity of fiber 15. This can be used to provide a coded track circuit constructed according to the invention with the capability of detecting broken rail locations within centimeters”).

As per Claim 2, Colbaugh discloses the system wherein both the emitter and the analyzer are connected to an end of the fiber (Colbaugh Fig.3A & Fig.4), and wherein the first altered optical signal is a signal reflected by the fiber towards said end (Colbaugh col.4 lines 52-57: “Microbending also causes some light energy to be reflected counter to the original direction of propagation. Optical time domain reflectometer ("OTDR") 20 may be utilized to measure this reflective light and map the variation of microbending strain experienced over a distributed length of fiber”).

As per Claim 16, Colbaugh discloses a process for monitoring a railway system, comprising:

placing an optical fiber along at least a part of a track of a rail (Colbaugh

Fig.5/col.6 lines : “Referring particularly to FIG. 5, a sensitized elongated optical fiber conductor 64 is attached to rail 65 by placement within longitudinal groove 66”);

attaching a portion of the optical fiber to said track such that a characteristic of the fiber varies with a variance in the track (Colbaugh col.6 lines 39-50: “FIG. 6 and 7 illustrate elongated optical fiber conductors attached to the track section at a plurality of spaced apart discrete locations. Standard wayside structures such as rail-retaining tie plates and rail crossties carry portions of a passing vehicle's weight load which can be sensed utilizing the teachings herein. FIG. 6 illustrates an elongated optical fiber conductor 70 having sensitized sections 71 and 72 respectively placed between rail 73 and rail-retaining tie plates 74 and 75. Alternatively, sensitized sections 71 and 72 could be respectively placed between tie plates 74 and 75 and rail crossties 76 and 77” /Colbaugh describes structure 36 as the same as track described by Tam./ col.5 lines 23-35: “Strain effects imposed on engaging structure 36 due to bending, warping or vibration cause fiber 35 to become slightly longer than the at-rest position indicated by broken line 39. As a result, the phase of propagated light signals emanated by fiber 35 will be slightly shifted with respect to corresponding signals emanating from fiber 37. The resulting constructive or destructive interference effects can be measured at wave front interferometric detector ("WFID") 40 to determine the degree of strain imposed on engaging structure 36. In addition to detecting the presence of a railway vehicle, warped rail or the like may be detected by the

occurrence of vibration above a threshold level");

emitting a signal along said fiber that may be altered by said variance of the portion of the fiber (Colbaugh col.4 lines 3-8: “In optical communication with sets 12A-E is optical sensor 13 which responds to the presence of railway vehicle 14 by emitting vehicle detection signal which may be a reflection or change in intensity or other properties of a reference light signal or may be a generated light signal”/ col.4 lines 23-25: “Many details of attaching sensor 13 to the track section will depend on the particular technique used to analyze the variable light propagation characteristics”) ; and

analyzing the varied signal to determine information relating to said rail (Colbaugh describes structure 36 as the same as track described by Tam. col.5 lines 23-35: “Strain effects imposed on engaging structure 36 due to bending, warping or vibration cause fiber 35 to become slightly longer than the at-rest position indicated by broken line 39. As a result, the phase of propagated light signals emanated by fiber 35 will be slightly shifted with respect to corresponding signals emanating from fiber 37. The resulting constructive or destructive interference effects can be measured at wave front interferometric detector ("WFID") 40 to determine the degree of strain imposed on engaging structure 36. In addition to detecting the presence of a railway vehicle, warped rail or the like may be detected by the occurrence of vibration above a threshold level").

As per Claim 17, Colbaugh discloses the process wherein said information further relates to a train or vehicle on said rail (Colbaugh col.6 lines : “A railway vehicle passing over rail 65 causes a downward force "F" to exert strain on the sides of groove 66. Depending on the sensing technique utilized, other parameters such as distributed temperature, vibration, structural integrity and train motion can be detected. With some techniques, more than one of these parameters can be determined utilizing a single embedded optical fiber”).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 3-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbaugh Patent No. 5330136 in view of Varasi Patent No. 5641956.

As per claim 3, Colbaugh does not disclose the system of wherein the first part of the fiber includes a first Bragg grating created therein for generating the first reflected optical signal, wherein a characteristic of the first Bragg grating is variable in correspondence to the variance of said characteristic of said one track, and wherein the first reflected optical signal contains Information relating to the variance of the characteristic of the first Bragg grating.

Varasi discloses the system wherein the first part of the fiber includes a first Bragg grating created therein for generating the first reflected optical signal (Varasi col.10 lines 31-34: “The source 1 transmits a wideband optical signal 13 into the fiber 2. This signal interacts with the Bragg grating 11 inside the sensor 3 and both a reflected signal 14 and a transmitted signal 15 are generated"), wherein a characteristic of the first Bragg grating is variable in correspondence to the variance of said characteristic of said one track, and wherein the first reflected optical signal contains Information relating to the variance of the characteristic of the first Bragg grating (Varasi describes the structure 4 in his prior art as the same as the track of rails described by Tam in his reference.// Varasi col.10 lines 41-47: “The optical signal reflected from the Bragg grating sensors 3 is shifted in the optical spectrum as a result of the strains in the structure 4 at the location of the sensors. The radiation belonging to such a band is reflected by the grating 11 and is collected by the coupler 8 and is sent partially to the opto-acoustical analyzer that processes the radiation, acting like a tunable optical filter”).

At the time of the invention, it should be obvious to one ordinary skill in the art combine the railway monitoring system of Colbaugh with the method of Varasi.

The motivation would provide a complete compact and integrated system suitable for the real time monitoring of service strains on structures and components, with miniature characteristics and compatibility with the environmental conditions in which the structure or the component may operate, thereby it would provide

measurement and diagnostics of physical parameters on whatever structure (Varasi col.8 lines 17-22).

As per Claim 4, Colbaugh in view of Varasi discloses the system wherein the first Bragg grating is pre-strained in a direction at least substantially parallel to said one track (Varasi Fig.12/col.9 lines 66-67& col.10 lines 1-2: “The optical fiber 2 is mounted on or incorporated in the structure 4 and has integrated into it Bragg grating sensors 3 which are embedded with the fiber in the structure 4 or are bonded with the fiber 2 to the structure 4”).

As per Claim 5, Colbaugh in view of Varasi discloses the system wherein the characteristic of the first Bragg grating relates to a grating period of the first Bragg grating, and wherein the grating period is variable in correspondence to a change in a tensile strain that the first Bragg grating experiences (Varasi col.11 lines 52-58: “This operating mode is clearly useful as a scanning spectrometer for measuring the static strains applied to the fiber grating sensors. This operating mode also allows for the detection of periodic strains applied to the sensor 3 as long as the frequencies of change imposed on the sensor satisfy the Nyquist sampling rate criterion determined by the scanned opto-acoustic filter of the analyzer 7”).

As per Claim 6, Colbaugh in view of Varasi discloses the system wherein the first Bragg grating is attached to said one track such that the first Bragg grating

experiences a same tensile strain as said one track (Varasi col.10 lines 41-47: "The optical signal reflected from the Bragg grating sensors 3 is shifted in the optical spectrum as a result of the strains in the structure 4 at the location of the sensors. The radiation belonging to such a band is reflected by the grating 11 and is collected by the coupler 8 and is sent partially to the opto-acoustical analyzer that processes the radiation, acting like a tunable optical filter").

As per Claim 7, Colbaugh in view of Varasi discloses the system wherein the optical signal analyzer detects a shift in a wavelength of the first reflected optical signal for ascertaining the variance of the characteristic of the first Bragg grating (Varasi col.11 lines 37-51: "the analyzer 7 measures instantaneously the wavelength corresponding to the center of the reflected optical signal 14 from each fiber Bragg grating sensor 3. The transmission function 22 of the filter is tuned in a repetitive fashion over the entire region of optical wavelengths of interest in which the reflection of the grating 21 is contained. The variation of the wavelength of the tunable optical filter function is correlated to the variation of the frequency of the signal that generates the superposed acoustic field. Consequently, at instant 23 when the scanned filter function coincides with the reflected optical signal from the remote fiber grating sensor 3, optical detector 9 responds with the largest electrical response and thereby uniquely identifying the wavelength of the optical signal reflected by the sensor 3").

As per Claim 8, Colbaugh in view of Varasi discloses the System comprising a counter in connection with the optical signal analyzer for counting the number of the shifts in the wavelength of the first reflected optical signal, wherein said number relate to the number of axles of a train that passes over the first Bragg grating (Varasi col.11 lines 52-63: “This operating mode is clearly useful as a scanning spectrometer for measuring the static strains applied to the fiber grating sensors. This operating mode also allows for the detection of periodic strains applied to the sensor 3 as long as the frequencies of change imposed on the sensor satisfy the Nyquist sampling rate criterion determined by the scanned opto-acoustic filter of the analyzer 7. The Nyquest condition may limit the detectable bandwidth of dynamic strain signals during this mode of operation. Hence the system can be operated in a second useful mode to increase the allowed bandwidth for detection of high frequency dynamic strains”).

As per Claim 9, Colbaugh in view of Varasi discloses the system comprising a clock in connection with the optical signal analyzer for measuring a period of time between a predetermined number of successive shifts In the wavelength of the first reflected optical signal so as to ascertain a speed of the train (Varasi col.11 lines 52-63: “This operating mode is clearly useful as a scanning spectrometer for measuring the static strains applied to the fiber grating sensors. This operating mode also allows for the detection of periodic strains applied to the sensor 3 as long as the frequencies of change imposed on the sensor satisfy the Nyquist sampling rate criterion determined by the scanned opto-acoustic filter of the analyzer 7. The Nyquest condition may limit

the detectable bandwidth of dynamic strain signals during this mode of operation. Hence the system can be operated in a second useful mode to increase the allowed bandwidth for detection of high frequency dynamic strains").

As per Claim 10, Colbaugh in view of Varasi does not disclose the system of comprising a processor in connection with

The optical signal analyzer, wherein the processor ascertains a period of time between two successive trains by

constantly measuring a period of time between two successive shifts in the wavelength of the first reflected optical signal;

comparing said period of time between two successive shifts with a predetermined threshold value; and

determining the period of time between two successive trains if said period of time between two successive shifts exceeds the predetermined threshold value (In view of the applicant admitted prior art (page 6 line 13: "Since the physical separation between the axles in a train is generally well known"), Colbaugh in view of Varasi does not disclose all the limitations of claim 10, and applicant admitted prior art discloses the distance between the axles in a train is known, therefore it would be obvious to one skill in the art to use the knowledge to determine the existence of two successive trains by comparing the distance between the last axle of the first train and the first axle of the second train).

3. Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbaugh Patent No. 5330136, in view of Varasi Patent No. 5641956 and further in view of Vengsarkar Patent No. 5641956.

As per claim 11, Colbaugh in view of Varasi does not disclose the system wherein the characteristic of the first Bragg grating relates to a grating period of the first Bragg grating, and wherein the grating period is variable in correspondence to a change in an environment temperature that the first Bragg grating experiences.

Vengsarkar discloses the system wherein the characteristic of the first Bragg grating relates to a grating period of the first Bragg grating, and wherein the grating period is variable in correspondence to a change in an environment temperature that the first Bragg grating experiences (Vengsarkar col.6 lines 50-62: “The temperature-induced shift in the coupling wavelength of the long-period grating occurred due to a number of concurrent effects. First, the thermo-optic effect caused temperature changes in the refractive index of both the core and cladding of the fiber. In addition, a change in temperature caused the long-period grating to expand and contract, which in turn caused a change in the grating period. It was found that the coupling wavelength of the long-period grating was very sensitive to changes in the period of the grating. Finally, the diameter of the core and cladding of the long-period grating changed when the grating expanded and contracted through the Poisson effect”).

At the time of the invention, it would have been obvious to one ordinary skill in the art to Vengsarkar's method with the railway monitoring system that Colbaugh and Varasi teach.

The motivation would provide an optical waveguide sensor arrangement for sensing at least one physical parameter which does not require the use of a Bragg grating and provide an optical waveguide sensor arrangement which senses changes in at least one physical parameter which uses a long period grating grating to couple guided modes to lossy non-guided modes to produce a wavelength transmission spectrum functionally dependent on the physical parameter sensed (Vengsarkar col.3 lines 20-29).

As per claim 12, Vengsarkar discloses the system wherein the optical signal analyzer ascertains change in the environment temperature (Vengsarkar col.6 lines 45-47: “Temperature sensitivity measurements were taken by placing the long-period, grating-based optical waveguide sensors in a thermocouple-monitored chamber”) by

ascertaining whether there is a shift in the wavelength of the first reflected optical signal (Vengsarkar col.6 lines 47-53: “The shift in the coupling wavelength, lambda sub.p, was monitored using an optical spectrum analyzer (OSA) while the gratings were held taut between two fibers to eliminate the effects of bends. The temperature-induced shift in the coupling wavelength of the long-period grating occurred due to a number of concurrent effects”); and

simultaneously ascertaining whether such a shift varies during a predetermined period (Vengsarkar col.6. lines 50-65: “The temperature-induced shift in the coupling wavelength of the long-period grating occurred due to a number of concurrent effects. First, the thermo-optic effect caused temperature changes in the

refractive index of both the core and cladding of the fiber. In addition, a change in temperature caused the long-period grating to expand and contract, which in turn caused a change in the grating period. It was found that the coupling wavelength of the long-period grating was very sensitive to changes in the period of the grating. Finally, the diameter of the core and cladding of the long-period grating changed when the grating expanded and contracted through the Poisson effect. Small changes in the core and cladding diameter altered the effective refractive index of the core and ladding modes which in turn could be monitored as a shift in the coupling wavelength").

4. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbaugh Patent No. 5330136 in view of Varasi Patent No. 5641956 and further in view of Moslehi Pub No. US 2004/0052444 A1.

As per claim 13, Colbaugh in view of Varasi does not further disclose the system comprising a second Bragg grating created in a second part of the fiber attachable to the other track for ascertaining variance of a characteristic of the other track, wherein the second Bragg grating generates a second reflected optical signal receivable by the optical signal analyzer, wherein shift in the wavelength of the second reflected optical signal In correspondence to the variance of the characteristic of the other track is detectable by the optical signal analyzer.

Moslehi further discloses the system comprising a second Bragg grating created in a second part of the fiber attachable to the other track for ascertaining variance of a characteristic of the other track (Moslehi par[0044]: "Measurement system 20 is

coupled to fibers 45 and 51. Each of fibers 45 and 51 has a Bragg grating 46 and 52 respectively. Measurement system 20 further comprises a controller 22 having a first source enable output 24 coupled to first source 36, which may be any source of optical energy having a spectrum which includes the wavelength of the grating 46 on fiber 45….Similarly, second source enable output 26 is coupled to second source 40, which has the same requirement of including in its output spectrum the wavelengths of the grating 52 of fiber 51"), wherein the second Bragg grating generates a second reflected optical signal receivable by the optical signal analyzer (Moslehi par[0049]: "An entirely separate measurement can be made by disabling first source 36 and enabling second source 40. In this case, optical energy would leave second splitter 44 through fiber 51 to grating 52. Optical energy at wavelength lambda..sub.2 52 would be returned to second splitter 44 through fiber-optic cable 51, leave second splitter 44 through fiber-optic cable 43, entering wavelength discriminator 38. Analogous to the earlier described processing, first source 36 would be disabled, and hence no optical energy would be present in fiber 41. In the case of wave energy input to fiber 43 instead of fiber 41, the output characteristic of FIG. 5 would be reversed such that curve 100 would be the output energy on fiber 33, and curve 104 would represent the output energy of fiber 31. If the grating 52 were reflecting a lambda.sub.2=1306 nm, then second detector 34 would produce 0.75 volts as shown in curve 108 of FIG. 5"), wherein shift in the wavelength of the second reflected optical signal in correspondence to the variance of the characteristic of the other track is detectable by the optical signal analyzer (Moslehi par[0055-0062]: "In this equation, the change in

sensor wavelength is expressed as the sum of a temperature related change and a strain related change. The coefficients .alpha.1 and .alpha.1 would be stored in the controller along with initial condition values to solve for total strain and total temperature. In this manner, any combinations of strain and temperature could be determined given a change in sensor wavelength and the wavelength discriminator characteristic curve, and first and second detector inputs").

At the time of the invention, it would have been obvious to one ordinary skill in the art to use Moslehi's method with the railway monitoring system that Colbaugh and Varasi teach.

The motivation would provide a detection of minimum returned wave energy to extract a sensor wavelength reference to the original grating wavelength indicates the application of either temperature or strain to the grating, thereby a dimensional change in a fiber having a Bragg grating is detected using a measurement system comprising broad-band sources, optical power splitters, a high-sensitivity wavelength discriminator, optical detectors, and a controller (Moslehi Abs. lines 9-18)

As per claim 14, Moslehi further discloses the system comprising a processor in connection with the optical signal analyzer for ascertaining an imbalance on the pair of tracks based upon the shifts in the wavelengths of the first and second reflected optical signals (Moslehi par[0055-0062]: "If the sensors were operating either as temperature sensors or strain sensors, the applied strain or temperature could be computed from the following relationship DELTAlambda= alpha 1 DELTA.T+ alpha2 .DELTA.S where

DELTA..lambda.=change in sensor wavelength//alpha.1=coefficient of thermal change for sensor//DELTA.T=change in sensor temperature // alpha2= coefficient of strain change for sensor//DELTA.S=change in sensor strain// In this equation, the change in sensor wavelength is expressed as the sum of a temperature related change and a strain related change. The coefficients .alpha.1 and .alpha.1 would be stored in the controller along with initial condition values to solve for total strain and total temperature. In this manner, any combinations of strain and temperature could be determined given a change in sensor wavelength and the wavelength discriminator characteristic curve, and first and second detector inputs").

As per claim 15, Moslehi further discloses the system comprising a plurality of Bragg gratings created In the fiber and attachable to the pair of tracks, wherein the first, second and plurality of Bragg gratings are positioned in correspondence to spacing between axles and bogies of a train for ascertaining a characteristic of the train (Moslehi describes in his prior art the strain/temperature measurement system as the same as the characteristic of the train described by Tam. Moslehi Fig.8/par[0063]: "FIG. 8 shows a strain/temperature measurement system having a 3-way wavelength discriminator 162. This system is analogous to the system described in FIG. 2, however, for an n-way wavelength discriminator, the output port associated with the excited port has the response shown in plot 186, while the remaining ports have the characteristic shown in plot 188. For example, in the case of FIG. 8, first source 134 sends broadband excitation through first splitter 136, and wave energy at the example

grating wavelength lambdasub.1=1300 nm is reflected through splitter 136 to wavelength discriminator port 167. For this case, the output at port 168 has the characteristic shown in plot 186, while the second output 174 and third output 180 have the responses shown by curve 188. For .lambda..sub.1=1300 nm, the response of the first detector is shown as point 192, while the second the third detectors have the response shown by point 194").

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMINE BENLAGSIR whose telephone number is (571)270-5165. The examiner can normally be reached on Monday-Friday 7:30am-5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hai Tran can be reached on (571)272-7305. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO

Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. B./

Examiner, Art Unit 4147

08/03/2009
/Hai Tran/
Supervisory Patent Examiner, Art Unit 4147